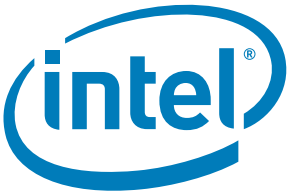

Intel® Solid-State Drive 311 Series

Product Specification

- Capacity: 20 GB
- Components: Intel® 34nm NAND Flash Memory Single-Level Cell (SLC)
- Form Factors:
  - — 2.5-inch SATA
    Thickness: 9.5 mm
    Weight: up to 80 grams
  - — Full-sized mSATA
    Thickness: 3.6 mm
    Weight: up to 10 grams
- Bandwidth Performance
  - — Sustained Sequential Read: Up to 200 MB/s
  - — Sustained Sequential Write: Up to 105 MB/s
- Read and Write IOPS (Iometer* Queue Depth 32)
  - — Random 4 KB[1] Reads: Up to 37,000 IOPS
  - — Random 4 KB Writes:Up to 3,300 IOPS
- Latency
  - — Read: 65 µs (TYP)
  - — Write: 75 µs (TYP)
- Compatibility
  - — Intel® Smart Response Technology
  - — Intel® Rapid Storage Technology
  - — Intel® SSD Toolbox with Intel® SSD Optimizer
  - — SATA Revision 2.6; compatible with SATA 1.5Gb/s and 3Gb/s interface rates
  - — ATA/ATAPI-7
  - — SSD-enhanced S.M.A.R.T. ATA feature set
  - — Native Command Queuing (NCQ) command set
  - — Data set management command Trim attribute
- Power Management
  - — 5 V (2.5-inch SATA) Supply Rail
  - — 3.3 V (mSATA) Supply Rail
  - — SATA interface power management
- Power
  - — Active (MobileMark* 2007 Workload): 150 mW (TYP)
  - — Idle[2]: 75 mW (TYP)
- Temperature
  - — Operating: 0^{o} C to 70^{o} C
  - — Non-Operating: -55^{o} C to 95^{o} C
- Shock (operating and non-operating)
  - — 1,500 G/0.5 msec
- Vibration
  - — Operating: 2.17 G_{RMS} (5-700 Hz)
  - — Non-operating: 3.13 G_{RMS} (5-800 Hz)
- Reliability
  - — Uncorrectable Bit Error Rate (UBER): 1 sector per 10^{16} bits read
  - — Mean Time Between Failures (MTBF): 1,200,000 hours
- Certifications and Declarations
  - — UL*
  - — CE*
  - — C-Tick*
  - — BSMI*
  - — KCC*
  - — Microsoft* WHQL
  - — VCCI*
  - — SATA-IO*
- Product Ecological Compliance
  - — RoHS*

1. 4 KB = 4,096 bytes
2. Device Initiated Power Management (DIPM)-enabled.

Order Number: 325334-001US
May 2011

Ordering Information

Contact your local Intel sales representative for ordering information.

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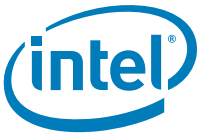
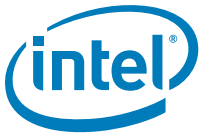




1.0 Overview

This document describes the specifications and capabilities of the Intel® Solid-State Drive 311 Series (Intel® SSD 311 Series).

The Intel SSD 311 Series combines Intel® 34nm SLC NAND Flash Memory technology with our innovative high-performance controller to deliver a high- performance, high-endurance solid-state drive (SSD) targeted for solutions that use an SSD as a cache for hard disk drives, such as systems with Intel® Smart Response Technology, or for high-performance embedded solutions.

The Intel SSD 311 Series is available in two form factors: 2.5-inch SATA for traditional SATA designs and mSATA for small form factor designs.

2.0 Product Specifications

2.1 Capacity

Table 1. User Addressable Sectors

Unformatted Capacity	Intel SSD 311 Series 20GB SSD
Total User Addressable Sectors in LBA Mode	39,091,248

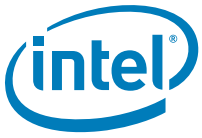
Notes: LBA count shown represents total user storage capacity and will remain the same throughout the life of the drive.
The total usable capacity of the SSD may be less than the total physical capacity because a small portion of the capacity is used for NAND flash management and maintenance purposes.
1 GB = 1,000,000,000 bytes; 1 sector = 512 bytes.

2.2 Performance

Table 2. Read/Write IOPS, Bandwidth, Latency

Performance	Intel SSD 311 Series 20GB SSD
Random Read/Write IOPS (Input/Output Operations Per Second)[1]	
4 KB Read	Up to 37,000
4 KB Write	Up to 3,300
Maximum Sustained Read and Write Bandwidth[2]	
Sequential Read	Up to 200 MB/s
Sequential Write	Up to 105 MB/s
Latency[3]	
Read	65 µs (TYP)
Write	75 µs (TYP)
Power On to Ready	1.50 s (TYP)

Notes:
1. Performance measured using Iometer* with Queue Depth (QD) set to 32. Measurements are performed on 8 GB of LBA range. Write Cache enabled. 4 KB = 4,096 bytes.
2. Performance measured using Iometer with QD set to 32.
Sequential performance measurements assume 1 MB/sec = 1,048,576 bytes/sec.
3. Device measured using Iometer; Read/Write latency measured on sequential 4 KB (4,096 bytes) transfers with QD set to 1. Write Cache Enabled.
Power On To Ready time measured from power rail rising edge to the first DRDY issued from the drive.



2.3 Electrical

Table 3. Operating Voltage and Power Consumption

Electrical Characteristics	Value
Operating voltage for 5 V (± 5%)	
Min	4.75 V
Max	5.25 V
Operating Voltage for 3.3 V (± 5%)	
Min	3.14 V
Max	3.47 V
Power Consumption (Typical)	
Active[1]	150 mW
Idle[2]	75 mW

Notes:
1. Active power measured during execution of MobileMark* 2007 with DIPM (Device Initiated Power Management) enabled.
2. Idle power defined as SSD at idle with DIPM enabled.

2.4 Environmental Conditions

Table 4. Temperature, Shock, Vibration

Temperature	Range
Ambient Temperature	
Operating	0 to 70 ^{o}C
Non-operating	-55 to 95 ^{o}C
Temperature Gradient[1]	
Operating	20 (Typical) ^{o}C/hr
Non-operating	30 (Typical) ^{o}C/hr
Humidity	
Operating	5 to 95 %
Non-operating	5 to 95 %
Shock, Vibration, Acoustics	**Range**
Shock[2]	
Operating	1,500 G (Max) at 0.5 msec
Non-operating	1,500 G (Max) at 0.5 msec
Vibration[3]	
Operating	2.17 G_{RMS} (5-700 Hz) Max
Non-operating	3.13 G_{RMS} (5-800 Hz) Max

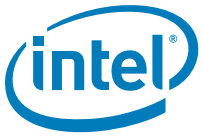
Notes:
1. Temperature gradient measured without condensation. Non-operating temperature specification does not include data retention.
2. Shock specifications assume the SSD is mounted securely with the input vibration applied to the drive-mounting screws. Stimulus may be applied in the X, Y or Z axis. Shock specification is measured using root mean squared (RMS) value.
3. Vibration specifications assume the SSD is mounted securely with the input vibration applied to the drive-mounting screws. Stimulus may be applied in the X, Y or Z axis. The measured specification is in RMS form. Vibration specification is measured using RMS value.

2.5 Product Regulatory Compliance

The Intel SSD 311 Series meets or exceeds the regulatory or certification requirements in Table 5.

Table 5. Product Regulatory Compliance Specifications

Title	Description	Region for which conformity declared
European Union Low Voltage Directive (LVD) 2006/95/EC	EN 60950-1 2nd edition for Information Technology Equipment - Safety - Part 1: General Requirements	European Union
UL/CSA 60950-1, Second Edition CAN/CSA-C22.2 No. 60950-1-07 Second Edition	Information Technology Equipment - Safety - Part 1: General Requirements	USA/Canada
CFR Title 47 Part 15	Radio Frequency Devices - Subpart B (Unintentional Radiators)	USA
ICES-003 Issue 4	Interference Causing Equipment Standard	Canada
EN 55022:2006	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	European Union
CNS 14348:2006	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	Taiwan
VCCI V3/2010.04	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	Japan
KN22 (2008-5)	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	Korea
CISPR 22:2006	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	International
EN 55024:1998	Information technology equipment - Immunity characteristics - Limits and methods of measurement (CISPR 24:1997, modified)	European Union
KN24 (2008-5)	Information technology equipment - Immunity characteristics - Limits and methods of measurement (CISPR 24:1997, modified)	Korea



2.6 Reliability

The Intel SSD 311 Series meets or exceeds SSD endurance and data retention requirements as specified in the JESD218 specification.

Reliability specifications are listed in Table 6.

Table 6. Reliability Specifications

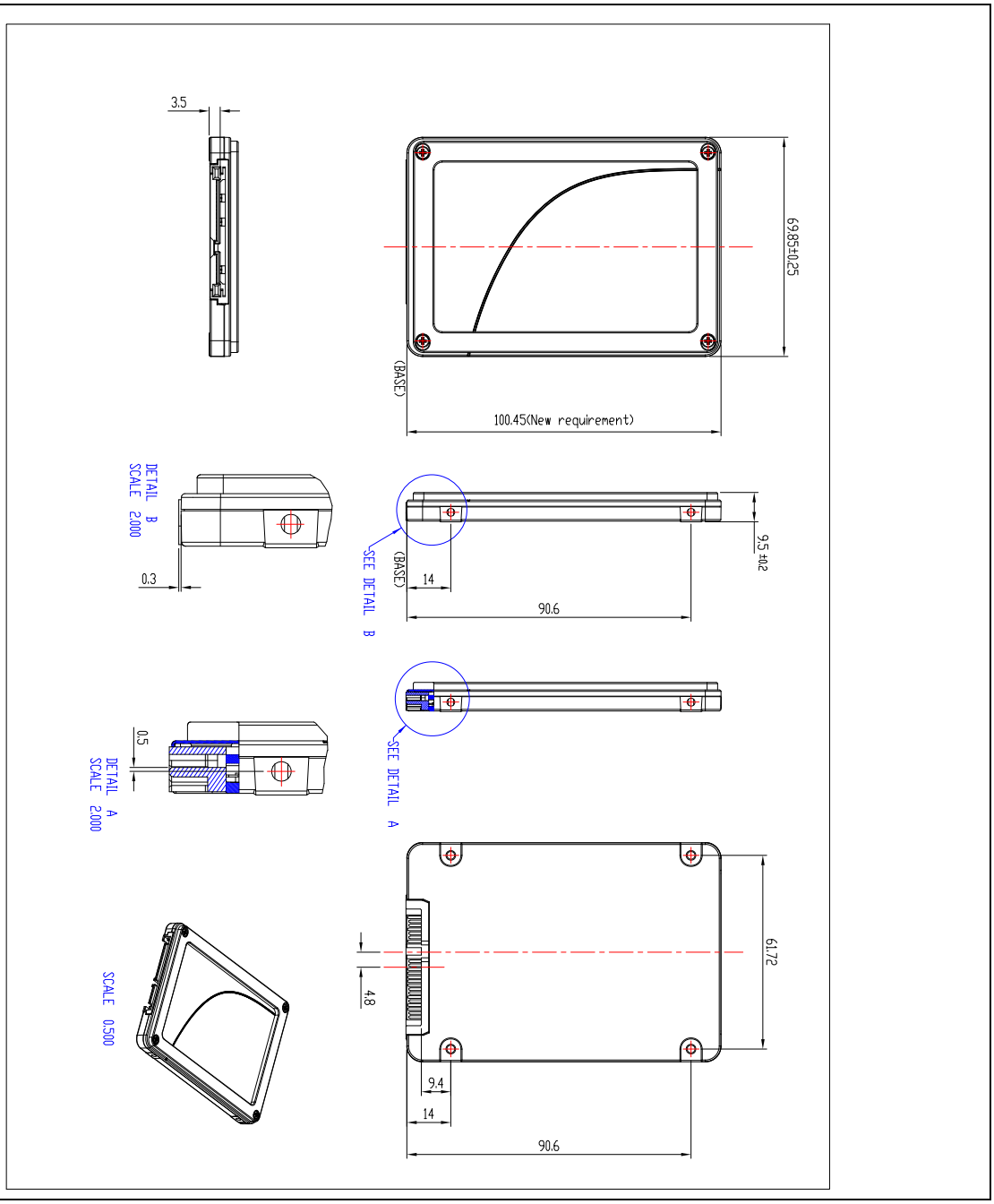
Parameter	Value
Uncorrectable Bit Error Rate (UBER) Uncorrectable bit error rate will not exceed one sector in the specified number of bits read. In the unlikely event of a nonrecoverable read error, the SSD will report it as a read failure to the host; the sector in error is considered corrupt and is not returned to the host.	1 sector in 10^{16} bits read, max
Mean Time Between Failures (MTBF) Mean Time Between Failures (MTBF) is estimated based on Telcordia* methodology and demonstrated through Reliability Demonstration Test (RDT).	1,200,000 hours
Power On/Off Cycles Power On/Off Cycles is defined as power being removed from the SSD, and then restored. Most host systems remove power from the SSD when entering suspend and hibernate as well as on a system shutdown.	50,000 cycles
Minimum Useful Life/Endurance Rating The SSD will have a minimum of five years of useful life under typical client workloads with up to 20 GB of host writes per day.	5 years
Insertion Cycles Insertion/removal cycles on SATA/power cable or mSATA/power cable.	2.5-inch SATA form factor: 250 insertion/removal cycles mSATA form factor: 50 insertion/removal cycles

3.0 Mechanical Information

3.1 2.5-inch SATA SSD

Figure 1 shows the physical package information for the Intel SSD 311 Series in the 2.5-inch SATA form factor. All dimensions are in millimeters.

Figure 1. 2.5-inch SATA Form Factor Dimensions

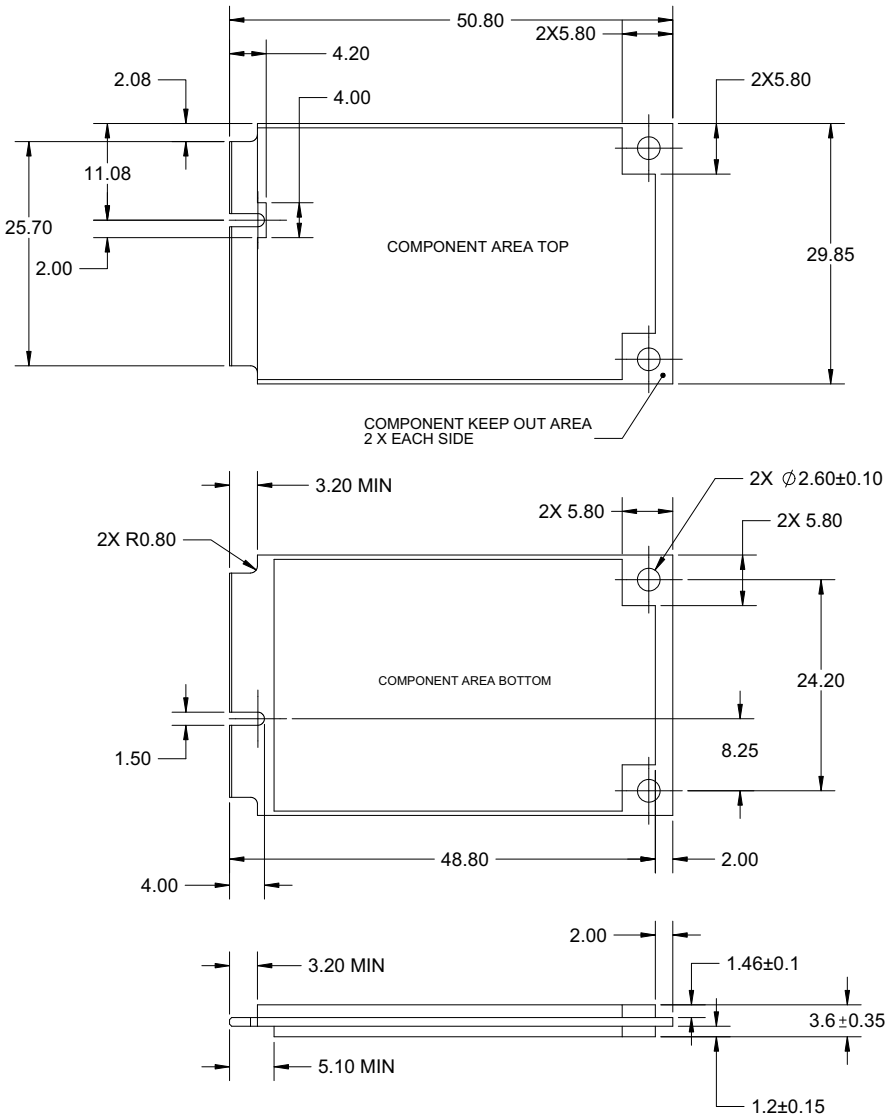


3.2 mSATA SSD

Figure 2 shows the physical package information for the Intel SSD 311 Series in the mSATA form factor. All dimensions are in millimeters.

Note: Total typical thickness of the Intel SSD 311 Series is less than the standard mSATA z-height specification of 4.85 mm.

Figure 2. mSATA Form Factor Dimensions

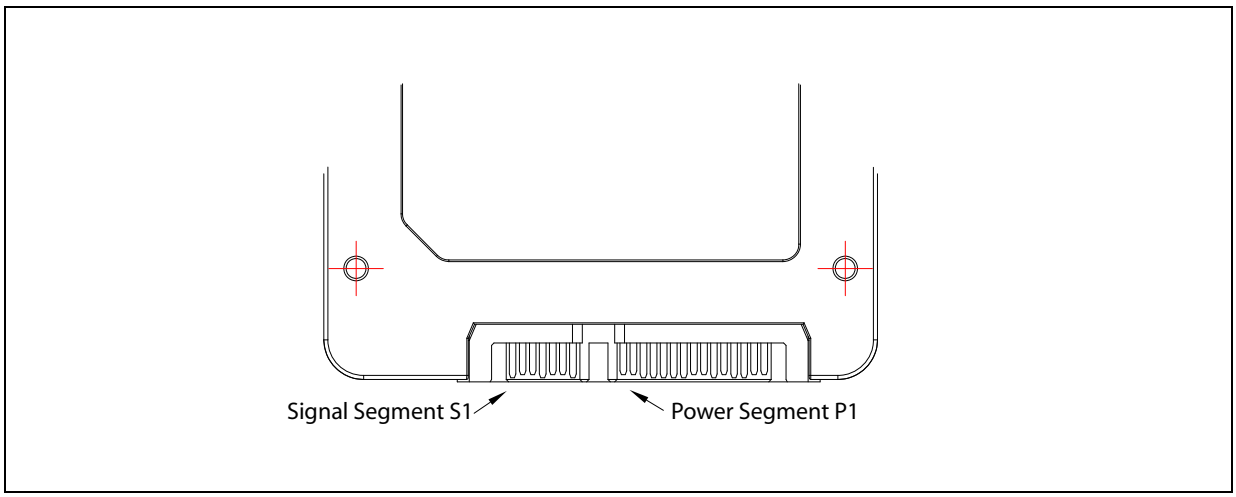


4.0 Pin and Signal Descriptions

This section identifies the pin locations and signal descriptions for Intel SSD 311 Series.

4.1 2.5-inch SATA SSD Pin Locations

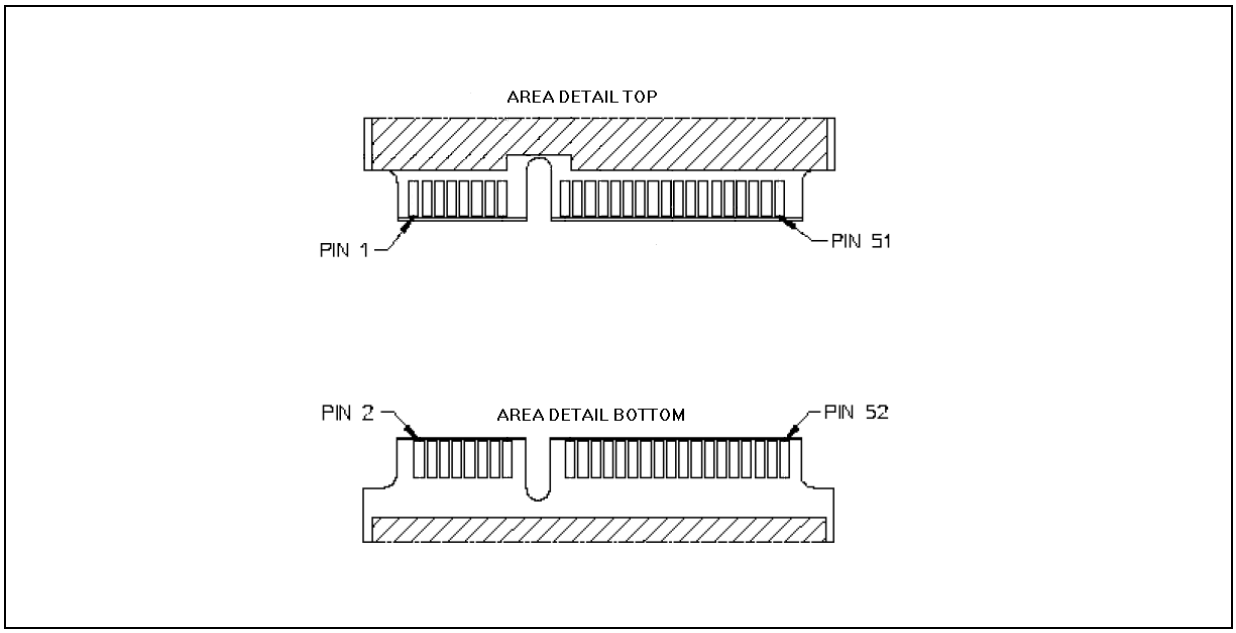
Figure 3. SATA Signal and Power Segment Pins

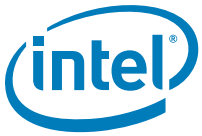


Note: 2.5-inch connector supports in-built latching capability.

4.2 mSATA SSD Pin Locations

Figure 4. mSATA Signal and Power Segment Pins





4.3 Signal Descriptions

4.3.1 2.5-inch SATA SSD Signal Descriptions

Table 7. SATA Connector Pin Signal Definitions

Pin	Function	Definition
S1	Ground	1st mate
S2	A+	Differential signal pair A
S3	A-	
S4	Ground	1st mate
S5	B-	Differential signal pair B
S6	B+	
S7	Ground	1st mate

Note: Key and spacing separate signal and power segments.

Table 8. SATA Power Pin Definitions

Pin[1]	Function	Definition	Mating Order
P1[2]	Not connected	(3.3 V Power)	
P2[2]	Not connected	(3.3 V Power)	
P3[2]	Not connected	(3.3 V Power. pre-charge)	2nd Mate
P4[3,4]	Ground		1st Mate
P5[3]	Ground		1st Mate
P6[3]	Ground		1st Mate
P7[3,5]	V_5	5 V Power	1st Mate
P8[3,5]	V_5	5 V Power	2nd Mate
P9[3,5]	V_5	5 V Power	2nd Mate
P10[3]	Ground		1st Mate
P11[6]	DAS	Device Activity Signal	2nd Mate
P12[3,4]	Ground		1st Mate
P13[7]	V_{12}	12 V Power. Not used.	1st Mate
P14[7]	V_{12}	12 V Power. Not used.	2nd Mate
P15[7]	V_{12}	12 V Power. Not used.	2nd Mate

Notes:
1. All pins are in a single row, with a 1.27 mm (0.050-inch) pitch.
2. Pins P1, P2 and P3 are connected together, although they are not connected internally to the device. The host may put 3.3 V on these pins.
3. The mating sequence is:
   — the ground pins P4-P6, P10, P12 and the 5V power pin P7.
   — the signal pins and the rest of the 5V power pins P8-P9.
4. Ground connectors P4 and P12 may contact before the other 1st mate pins in both the power and signal connectors to discharge ESD (Electro-Static Discharge) in a suitably configured backplane connector.
5. Power pins P7, P8, and P9 are internally connected to one another within the device.
6. The host may ground P11 if it is not used for Device Activity Signal (DAS).
7. Pins P13, P14 and P15 are connected together, although they are not connected internally to the device. The host may put 12 V on these pins.

4.3.2 mSATA SSD Signal Descriptions

Table 9. mSATA Connector Pin Signal Definitions

Pin	Function	Definition
P1	Reserved	No Connect
P2	+3.3 V	3.3 V Source
P3	Reserved	No Connect
P4	GND	Return Current Path
P5	Reserved	No Connect
P6[1]	+1.5 V	1.5 V Source
P7	Reserved	No Connect
P8	Reserved	No Connect
P9	GND	Return Current Path
P10	Reserved	No Connect
P11	Reserved	No Connect
P12	Reserved	No Connect
P13	Reserved	No Connect
P14	Reserved	No Connect
P15	GND	Return Current Path
P16	Reserved	No Connect
P17	Reserved	No Connect
P18	GND	Return Current Path
P19	Reserved	No Connect
P20	Reserved	No Connect
P21	GND	Return Current Path
P22	Reserved	No Connect
P23	+B	Host Receiver Differential Signal Pair This is an output of the SSD.
P24	+3.3 V	3.3 V Source
P25	-B	Host Receiver Differential Signal Pair This is an output of the SSD.
P26	GND	Return Current Path
P27	GND	Return Current Path
P28[1]	+1.5 V	1.5 V Source
P29	GND	Return Current Path
P30[2]	Two Wire Interface	Two Wire Interface Clock
P31	-A	Host Transmitter Differential Signal Pair This is an input of the SSD.
P32[2]	Two Wire Interface	Two Wire Interface Data
P33	+A	Host Transmitter Differential Signal Pair This is an input of the SSD.
P34	GND	Return Current Path
P35	GND	Return Current Path
P36	Reserved	No Connect
P37	GND	Return Current Path
P38	Reserved	No Connect
P39	+3.3 V	3.3 V Source
P40	GND	Return Current Path
P41	+3.3 V	3.3 V Source
P42	Reserved	No Connect
P43	Device Type	No Connect
P44	Reserved	No Connect
P45[3]	Vendor	Vendor Specific / Manufacturing Pin
P46	Reserved	No Connect

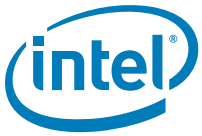


Table 9. mSATA Connector Pin Signal Definitions (Continued)

Pin	Function	Definition
P47[3]	Vendor	Vendor Specific / Manufacturing Pin
P48[1]	+1.5 V	1.5 V Source
P49	DA/DSS	Device Activity Signal / Disable Staggered Spin-up
P50	GND	Return Current Path
P51[4]	Presence Detection	Shall be pulled to GND by device
P52	+3.3 V	3.3 V Source

Notes:

1. 1.5 V rail is not used on the Intel SSD 311 Series. No connect on the host side.
2. Pins 30 and 32 are intended for use as a two-wire interface to read a memory device to determine device information (an example of this would be for use as SMB bus pins). These pins are not designed to be active in conjunction with the SATA signal differential pairs. Not used in the Intel SSD 311 Series. No connect on the host side.
3. Vendor-specific pins are not used in the Intel SSD 311 Series. No connect on the host side.
4. Presence detection pin indicates presence of an mSATA device.

5.0 Supported Command Sets

The Intel SSD 311 Series supports ATA (Advanced Technology Attachment) commands described in this section.

5.1 ATA General Feature Command Set

The Intel SSD 311 Series supports the ATA General Feature command set (non-PACKET), which consists of:

- EXECUTE DEVICE DIAGNOSTIC
- FLUSH CACHE
- IDENTIFY DEVICE

  Note: See Appendix A, "IDENTIFY DEVICE Command Data" on page 24 for details on the sector data returned after issuing an IDENTIFY DEVICE command.

- READ DMA
- READ SECTOR(S)
- READ VERIFY SECTOR(S)
- SEEK
- SET FEATURES
- WRITE DMA
- WRITE SECTOR(S)
- READ MULTIPLE
- SET MULTIPLE MODE
- WRITE MULTIPLE

The Intel SSD 311 Series also supports the following optional commands:

- READ BUFFFER
- WRITE BUFFER
- NOP
- DOWNLOAD MICROCODE

5.2 Power Management Command Set

The Intel SSD 311 Series supports the Power Management command set, which consists of:

- CHECK POWER MODE
- IDLE
- IDLE IMMEDIATE
- SLEEP
- STANDBY
- STANDBY IMMEDIATE

5.3 Security Mode Feature Set

The Intel SSD 311 Series supports the Security Mode command set, which consists of:

- SECURITY SET PASSWORD
- SECURITY UNLOCK
- SECURITY ERASE PREPARE
- SECURITY ERASE UNIT
- SECURITY FREEZE LOCK
- SECURITY DISABLE PASSWORD

5.4 SMART Command Set

The Intel SSD 311 Series supports the SMART command set, which consists of:

- SMART ENABLE OPERATIONS
- SMART DISABLE OPERATIONS
- SMART ENABLE/DISABLE AUTOSAVE
- SMART RETURN STATUS

The Intel SSD 311 Series also supports the following optional commands:

- SMART EXECUTE OFF-LINE IMMEDIATE
- SMART READ DATA
- SMART READ LOG
- SMART WRITE LOG

5.4.1 SMART Attributes

Table 10 lists the SMART attributes supported by the Intel SSD 311 Series and the corresponding status flags and threshold settings.

Table 10. SMART Attributes

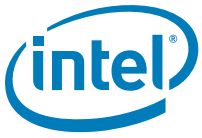
ID	Attribute	Status Flags[1]						Threshold
		SP	EC	ER	PE	OC	PW	
03h	Spin Up Time Reports a fixed value of zero (0).	1	0	0	0	0	0	0 (none)
04h	Start/Stop Count Reports a fixed value of zero (0).	1	1	0	0	0	0	0 (none)
05h	Re-allocated Sector Count The raw value of this attribute shows the number of retired blocks since leaving the factory (grown defect count).	1	1	0	0	1	0	0 (none)
09h	Power-On Hours Count Reports the cumulative number of power-on hours over the life of the device. However, the On/Off status of the Device Initiated Power Management (DIPM) feature will affect the number of hours reported. If DIPM is turned On, the recorded value for power-on hours does not include the time that the device is in a "slumber" state. If DIPM is turned Off, the recorded value for power-on hours should match the clock time, as all three device states are counted: active, idle and slumber.	1	1	0	0	1	0	0 (none)

Table 10. SMART Attributes (Continued)

ID	Attribute	Status Flags[1]						Threshold
		SP	EC	ER	PE	OC	PW	
0Ch	Power Cycle Count The raw value of this attribute reports the cumulative number of power cycle events over the life of the device.	1	1	0	0	1	0	0 (none)
B8h	End-to-End Error Detection Count Reports number of errors encountered during LBA tag checks, within the SSD data path.	1	1	0	0	1	1	90
C0h	Unsafe Shutdown Count The raw value of this attribute reports the cumulative number of unsafe (unclean) shutdown events over the life of the device. An unsafe shutdown occurs whenever the device is powered off without STANDBY IMMEDIATE being the last command.	1	1	0	0	1	0	0 (none)
E1h	Host Writes The raw value of this attribute reports the total number of sectors written by the host system. The raw value is increased by 1 for every 65,536 sectors (32MB) written by the host.	1	1	0	0	0	0	0 (none)
E8h	Available Reserved Space This attribute reports the number of reserve blocks remaining. The normalized value begins at 100 (64h), which corresponds to 100 percent availability of the reserved space. The threshold value for this attribute is 10 percent availability.	1	1	0	0	1	1	10
E9h	Media Wearout Indicator This attribute reports the number of cycles the NAND media has undergone. The normalized value declines linearly from 100 to 1 as the average erase cycle count increases from 0 to the maximum rated cycles. Once the normalized value reaches 1, the number will not decrease, although it is likely that significant additional wear can be put on the device.	1	1	0	0	1	0	0 (none)

Note: 1. The following table defines the SMART Attributes status flags.

Status Flag	Description	Value = 0	Value = 1
SP	Self-preserving attribute	Not a self-preserving attribute	Self-preserving attribute
EC	Event count attribute	Not an event count attribute	Event count attribute
ER	Error rate attribute	Not an error rate attribute	Error rate attribute
PE	Performance attribute	Not a performance attribute	Performance attribute
OC	Online collection attribute	Collected only during offline activity	Collected during both offline and online activity
PW	Pre-fail warranty attribute	Advisory	Pre-fail



5.4.2 SMART Logs

The Intel SSD 311 Series implements the following Log Addresses: 00h, 02h, 03h, 06h, and 07h.

The Intel SSD 311 Series implements host vendor specific logs (addresses 80h-9Fh) as read and write scratchpads, where the default value is zero (0). The Intel SSD 311 Series does not write any specific values to these logs unless directed by the host through the appropriate commands.

The Intel SSD 311 Series also implements a device vendor specific log at address A9h as a read-only log area with a default value of zero (0).

5.5 Data Set Management Command Set

The Intel SSD 311 Series supports the Data Set Management command set Trim attribute, which consists of:

- DATA SET MANAGEMENT EXT

5.6 Host Protected Area Command Set

The Intel SSD 311 Series supports the Host Protected Area command set, which consists of:

- READ NATIVE MAX ADDRESS
- SET MAX ADDRESS
- READ NATIVE MAX ADDRESS EXT
- SET MAX ADDRESS EXT

The Intel SSD 311 Series also supports the following optional commands:

- SET MAX SET PASSWORD
- SET MAX LOCK
- SET MAX FREEZE LOCK
- SET MAX UNLOCK

5.7 48-Bit Address Command Set

The Intel SSD 311 Series supports the 48-bit Address command set, which consists of:

- FLUSH CACHE EXT
- READ DMA EXT
- READ NATIVE MAX ADDRESS EXT
- READ SECTOR(S) EXT
- READ VERIFY SECTOR(S) EXT
- SET MAX ADDRESS EXT
- WRITE DMA EXT
- WRITE MULTIPLE EXT
- WRITE SECTOR(S) EXT
- WRITE UNCORRECTABLE EXT

5.8 Device Configuration Overlay Command Set

The Intel SSD 311 Series supports the Device Configuration Overlay command set, which consists of:

- DEVICE CONFIGURATION FREEZE LOCK
- DEVICE CONFIGURATION IDENTITY
- DEVICE CONFIGURATION RESTORE
- DEVICE CONFIGURATION SET

5.9 General Purpose Log Command Set

The Intel SSD 311 Series supports the General Purpose Log command set, which consists of:

- READ LOG EXT
- WRITE LOG EXT

5.10 Native Command Queuing

The Intel SSD 311 Series supports the Native Command Queuing (NCQ) command set, which includes:

- READ FPDMA QUEUED
- WRITE FPDMA QUEUED

Note: With a maximum queue depth equal to 32.

5.11 Software Settings Preservation

The Intel SSD 311 Series supports the SET FEATURES parameter to enable/disable the preservation of software settings.

5.12 Device Initiated Power Management (DIPM)

The Intel SSD 311 Series supports the SET FEATURES parameter to enable Device Initiated Power Management.

6.0 Certifications and Declarations

Table 11 describes the Device Certifications supported by the Intel SSD 311 Series.

Table 11. Device Certifications and Declarations

Certification	Description
UL Certified	Underwriters Laboratories, Inc. Component Recognition UL60950-1.
CE Compliant	Indicates conformity with the essential health and safety requirements set out in European Directives Low Voltage Directive and EMC Directive.
C-Tick Compliant	Compliance with the Australia/New Zealand Standard AS/NZS3548 and Electromagnetic Compatibility (EMC) Framework requirements of the Australian Communication Authority (ACA).
BSMI Compliant	Compliance to the Taiwan EMC standard "Limits and methods of measurement of radio disturbance characteristics of information technology equipment, CNS 13438 Class B."
KCC	Compliance with paragraph 1 of Article 11 of the Electromagnetic Compatibility control Regulation and meet the Electromagnetic Compatibility (EMC) Framework requirements of the Radio Research Laboratory (RRL) Ministry of Information and Communication Republic of Korea.
Microsoft WHQL	Microsoft Windows Hardware Quality Labs
VCCI	Voluntary Control Council for Interface to cope with disturbance problems caused by personal computers or facsimile.
SATA-IO	Indicates certified logo program from Serial ATA International Organization.
RoHS Compliant	Restriction of Hazardous Substance Directive

7.0 References

Table 12 identifies the standards information referenced in this document.

Table 12. Standards References

Date or Rev. #	Title	Location
Sept 2010	Solid-State Drive (SSD) Requirements and Endurance Test Method (JESD218)	http://www.jedec.org/standardsdocuments/docs/jesd218
Dec 2008	VCCI	http://www.vcci.jp/vcci_e/
June 2009	RoHS	Search for material description datasheet at http://qdms.intel.com/
April 2004	ATA/ATAPI-7	http://www.t10.org/t13/project/d1532v1r4a-ATA-ATAPI-7.pdf
June 2007	Intel® Rapid Storage Technology	http://support.intel.com/support/chipsets/imsm/
February 2007	Serial ATA Revision 2.6	http://www.sata-io.org
1995 1996 1995 1995 1997 1994	International Electrotechnical Commission EN 61000 4-2 (Electrostatic discharge immunity test) 4-3 (Radiated, radio-frequency, electromagnetic field immunity test) 4-4 (Electrical fast transient/burst immunity test) 4-5 (Surge immunity test) 4-6 (Immunity to conducted disturbances, induced by radio-frequency fields) 4-11 (Voltage Variations, voltage dips, short interruptions and voltage variations immunity tests)	http://www.iec.ch
1995	ENV 50204 (Radiated electromagnetic field from digital radio telephones)	http://www.dbicorporation.com/radimmun.htm

8.0 Additional Product Information

For additional information about the Intel SSD 311 Series, see the documentation in Table 13.

Table 13. Related Documentation

Order Number	Title
325502	Intel® Solid-State Drive 311 Series Product Brief

9.0 Terms and Acronyms

Table 14 defines the terms and acronyms used in this document.

Table 14. Glossary of Terms and Acronyms

Term	Definition
ATA	Advanced Technology Attachment
ATAPI	Advanced Technology Attachment Packet Interface
DAS	Device Activity Signal
DIPM	Device Initiated Power Management
DMA	Direct Memory Access
ESD	Electro-Static Discharge
EXT	Extended
FPDMA	First Party Direct Memory Access
GB	Gigabyte
GND	Ground
KB	Kilobytes
IOPS	Input/Output Operations Per Second
ISO	International Standards Organization
LBA	Logical Block Address
MB	Megabyte
mSATA	Mini-SATA
MTBF	Mean Time Between Failures
NCQ	Native Command Queuing
NOP	No Operation
PIO	Programmed Input/Output
RDT	Reliability Demonstration Test
RMS	Root Mean Squared
SATA	Serial Advanced Technology Attachment
SLC	Single-level Cell
SMART	Self-Monitoring, Analysis and Reporting Technology An open standard for developing hard drives and software systems that automatically monitors the health of a drive and reports potential problems.
SSD	Solid-State Drive
TYP	Typical

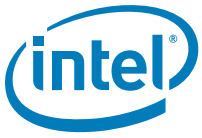


Table 14. Glossary of Terms and Acronyms (Continued)

Term	Definition
UBER	Uncorrectable Bit Error Rate

10.0 Revision History

Date	Revision	Description
May 2011	001	Initial release.

Appendix A IDENTIFY DEVICE Command Data

Table 15 details the sector data returned after issuing an IDENTIFY DEVICE command.

Table 15. Returned Sector Data

Word	F = Fixed V = Variable X = Both	Default Value	Description
0	F	0040h	General configuration bit-significant information
1	X	3FFFh	Obsolete - Number of logical cylinders (16,383)
2	V	C837h	Specific configuration
3	X	0010h	Obsolete - Number of logical heads (16)
4-5	X	0h	Retired
6	X	003Fh	Obsolete - Number of logical sectors per logical track (63)
7-8	V	0h	Reserved for assignment by the CompactFlash* Association (CFA)
9	X	0h	Retired
10-19	F	Varies	Serial number (20 ASCII characters)
20-21	X	0h	Retired
22	X	0h	Obsolete
23-26	F	Varies	Firmware revision (8 ASCII characters)
27-46	F	Varies	Model number (Intel® Solid-State Drive)
47	F	8010h	7:0—Maximum number of sectors transferred per interrupt on MULTIPLE commands
48	F	0h	Reserved
49	F	2F00h	Capabilities
50	F	4000h	Capabilities
51-52	X	0h	Obsolete
53	F	0007h	Words 88 and 70:64 Valid
54	X	3FFFh	Obsolete - Number of logical cylinders (16,383)
55	X	0010h	Obsolete - Number of logical heads (16)
56	X	003Fh	Obsolete - Number of logical sectors per logical track (63)
57-58	X	00FBFC10h	Obsolete
59	V	0101h	Number of sectors transferred per interrupt on MULTIPLE commands
60-61	F	02547630 (20 GB)	Total number of user-addressable sectors
62	X	0h	Obsolete
63	F	0007h	Multi-word DMA modes supported/selected
64	F	0003h	PIO modes supported
65	F	0078h	Minimum Multiword DMA transfer cycle time per word
66	F	0078h	Manufacturer's recommended Multiword DMA transfer cycle time
67	F	0078h	Minimum PIO transfer cycle time without flow control
68	F	0078h	Minimum PIO transfer cycle time with IORDY flow control
69	F	4020h	Command overlap and queuing
70	F	0h	Reserved
71-74	F	0h	Reserved for the IDENTIFY PACKET DEVICE command

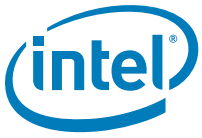


Table 15. Returned Sector Data (Continued)

Word	F = Fixed V = Variable X = Both	Default Value	Description
75	F	001Fh	Queue depth
76	F	0506h	Serial ATA capabilities
77	F	0h	Reserved for future Serial ATA definition
78	F	0048h	Serial ATA features supported
79	V	0040h	Serial ATA features enabled
80	F	00FCh	Major version number
81	F	001Ah	Minor version number
82	F	746Bh	Command set supported
83	F	7D01h	Command sets supported
84	F	6163h	Command set/feature supported extension
85	V	7469h	Command set/feature enabled
86	V	BC01h	Command set/feature enabled
87	V	6163h	Command set/feature default
88	V	007Fh	Ultra DMA Modes
89	F	0001h	Time required for security erase unit completion
90	F	0001h	Time required for enhanced security erase completion
91	V	0h	Current advanced power management value
92	V	FFFEh	Master Password Revision Code
93	F	0h	Hardware reset result: the contents of bits (12:0) of this word shall change only during the execution of a hardware reset
94	V	0h	Vendor's recommended and actual acoustic management value
95	F	0h	Stream minimum request size
96	V	0h	Streaming transfer time - DMA
97	V	0h	Streaming access latency - DMA and PIO
98-99	F	0h	Streaming performance granularity
100-103	V	02547630h (20 GB)	Maximum user LBA for 48-bit address feature set
104	V	0h	Streaming transfer time - PIO
105	F	0008h	Maximum number of 512-byte blocks of LBA range entries per DATA SET MANAGEMENT command
106	F	4000h	Physical sector size / logical sector size
107	F	0h	Inter-seek delay for ISO-7779 acoustic testing in microseconds
108-111	F	Varies	Unique ID
112-115	F	0h	Reserved for world wide name extension to 128 bits
116	V	0h	Reserved for technical report
117-118	F	0h	Words per logical sector
119	F	401Ch	Supported settings
120	F	401Ch	Command set/feature enabled/supported
121-126	F	0h	Reserved
127	F	0h	Removable Media Status Notification feature set support
128	V	0021h	Security status

Table 15. Returned Sector Data (Continued)

Word	F = Fixed V = Variable X = Both	Default Value	Description
129-159	X	0h	Vendor specific
160	F	0h	CompactFlash Association (CFA) power mode 1
161-168	X	0h	Reserved for assignment by the CFA
169	X	0001h	Data set management Trim attribute support
170-175	X	0h	Reserved for assignment by the CFA
176-205	V	0h	Current media serial number
206-216	F	0h	Reserved
217	F	0001h	Nominal Media Rotational Rate
218-221	F	0h	Reserved
222	F	101F	Reserved
223-233	F	0h	Reserved
234		0001h	Reserved
235		01F0h	Reserved
236-254	F	0h	Reserved
255	X	Varies	Integrity word (Checksum and Signature)

Notes: **F = Fixed**. The content of the word is fixed and does not change. For removable media devices, these values may change when media is removed or changed.
V = Variable. The state of at least one bit in a word is variable and may change depending on the state of the device or the commands executed by the device.
X = F or V. The content of the word may be fixed or variable.